International Linear Collider

the new HEP challenge

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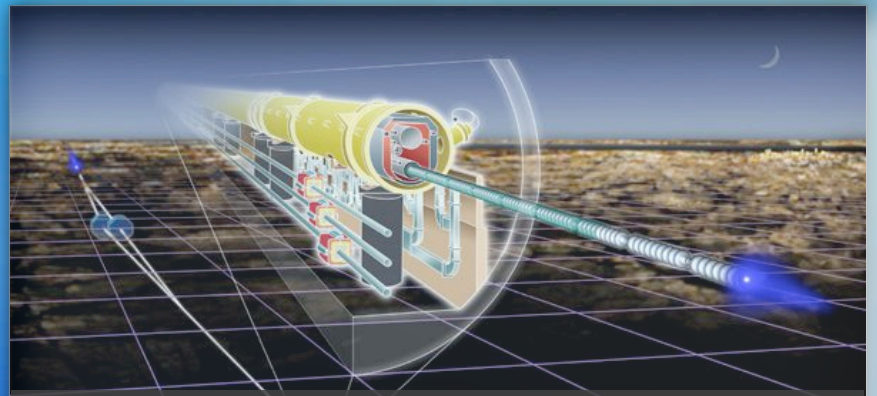
Big Toys

SRF Materials Group

Fermilab - Tevatron the energy frontier 1x1 TeV

CERN - LHC operational in 2 years 7x7 TeV

SLAC - SLC Linear accelerator



ILC - The FUTURE

Why a new machine?

BECAUSE WE ARE CURIOUS

- Are there undiscovered principles of nature:
  - New symmetries, new physical laws?
- How can we solve the mystery of dark energy?
- Are there extra dimensions of space?
- Do all the forces become one?
- Why are there so many kinds of particles?
- What is dark matter?
  - How can we make it in the laboratory?
- What are neutrinos telling us?
- How did the universe come to be?
- What happened to the antimatter?

Why e+e-?

elementary particles

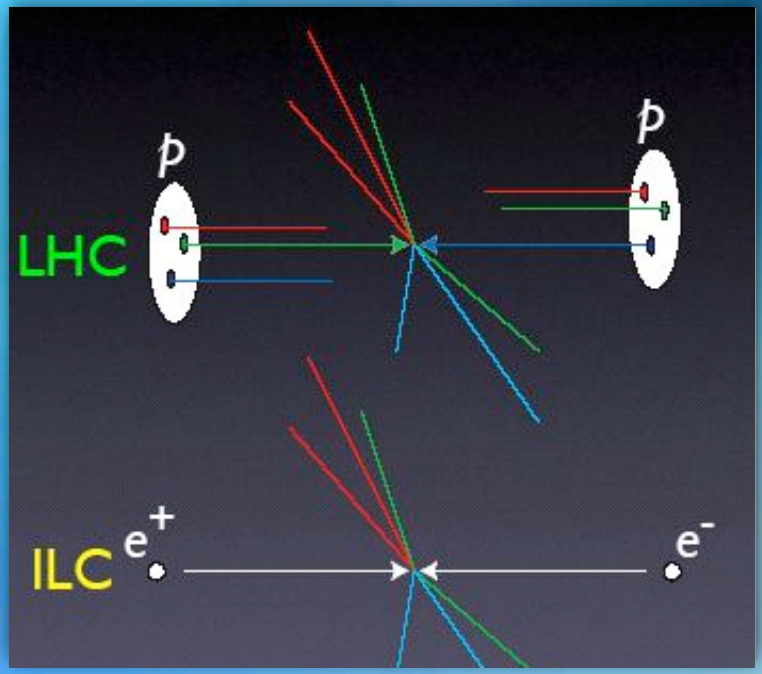
well-defined

- **energy,**
- **angular momentum**

uses full COM energy

produces particles democratically

can mostly fully reconstruct events

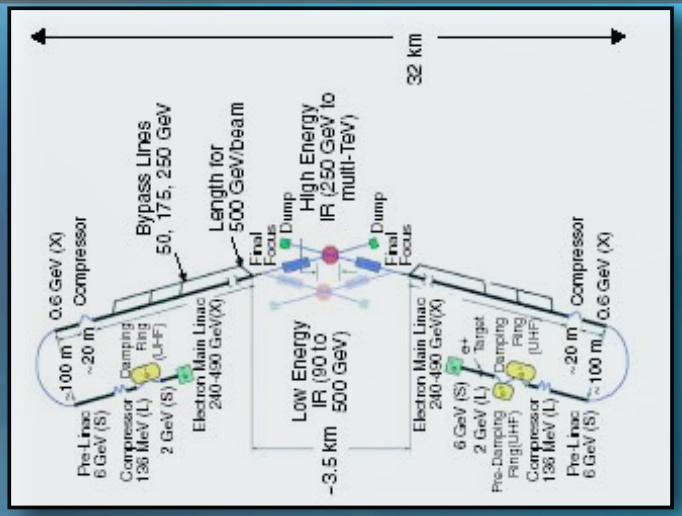


The precision information from LEP and other data have pointed to a low mass Higgs; Understanding electroweak symmetry breaking, whether supersymmetry or an alternative, will require precision measurements -> e+ e- Linear Collider

DO NOT ASK MORE THAN THIS OR I WILL BE IN TROUBLE!!!!!!!!!!!

Some History - before 2004

SRF Materials Group



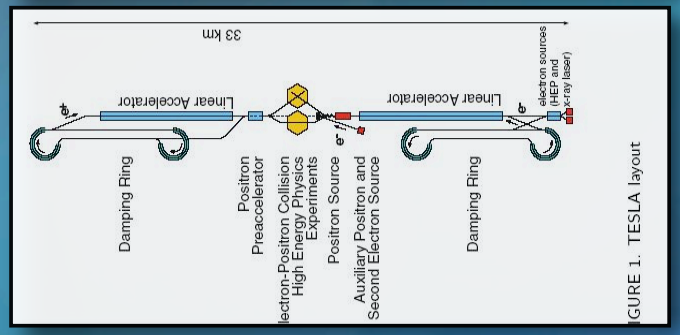
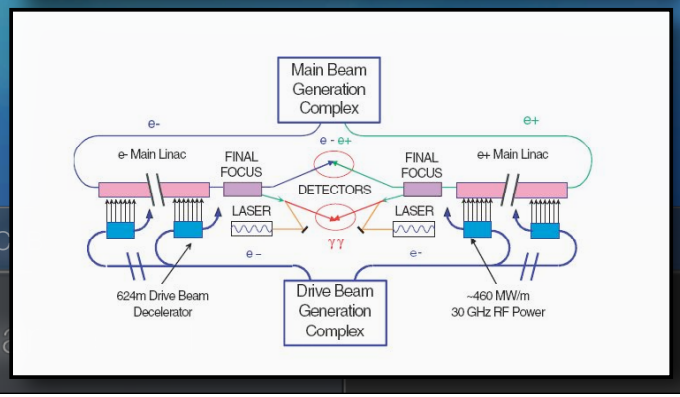
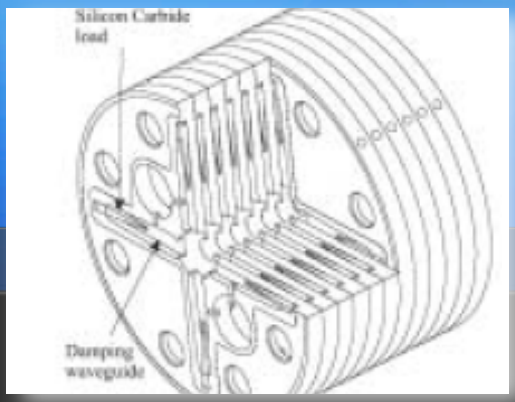


FIGURE 1. TESLA layout





NLC - JLC
US - Japan

Fermilab produced best performing cavity

TESLA
International - mostly Europe

Fermilab producing 3.9 Ghz cavities

CLIC
CERN

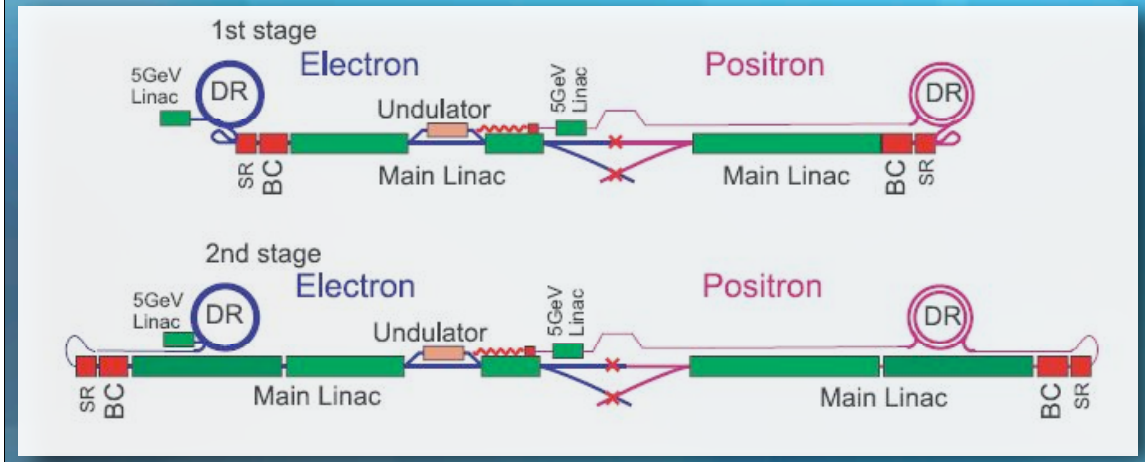
Some History - 2004

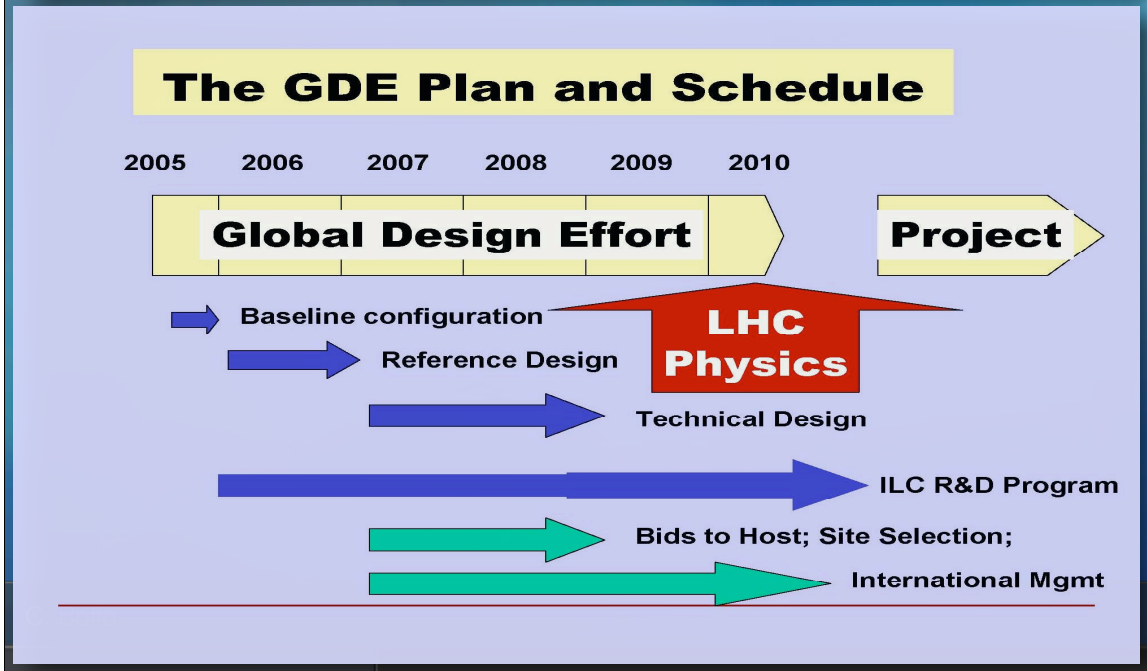
SCRF Technology Recommendation

The recommendation of ITRP was presented to ILCSC & ICFA on August 19, 2004 in a joint meeting in Beijing.

ICFA unanimously endorsed the ITRP's recommendation on August 20, 2004

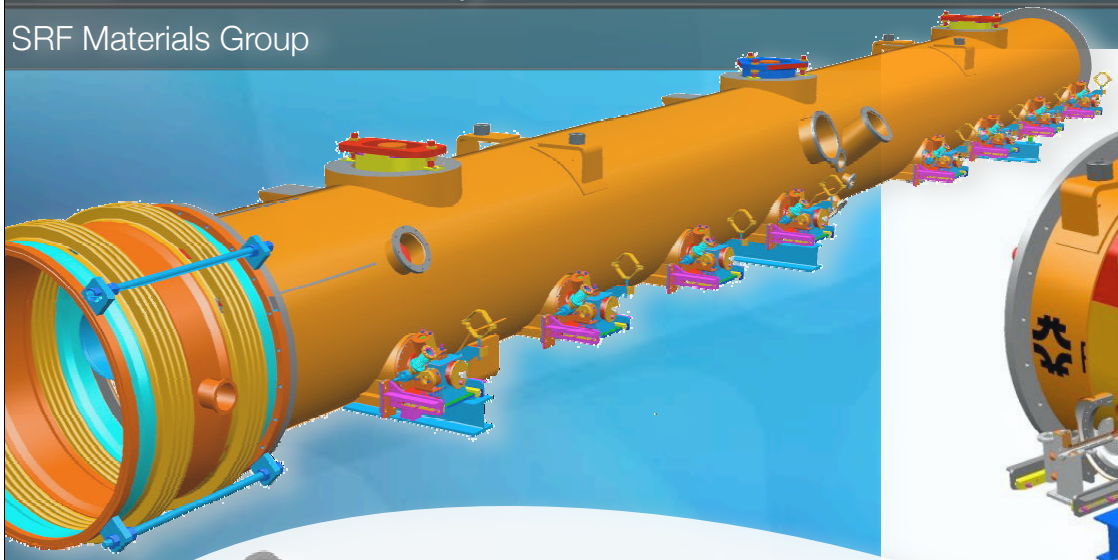
Some History - after 2004

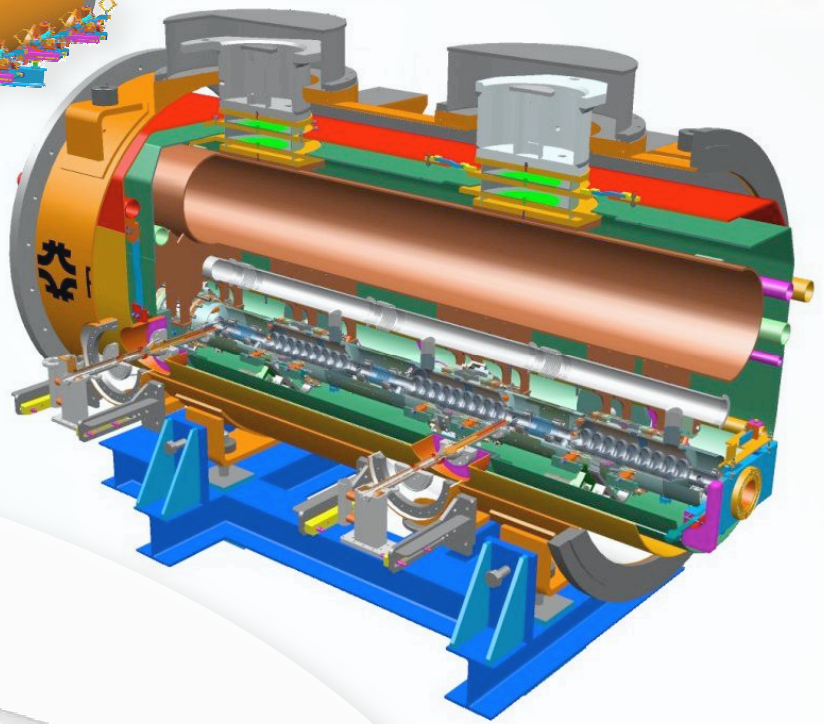


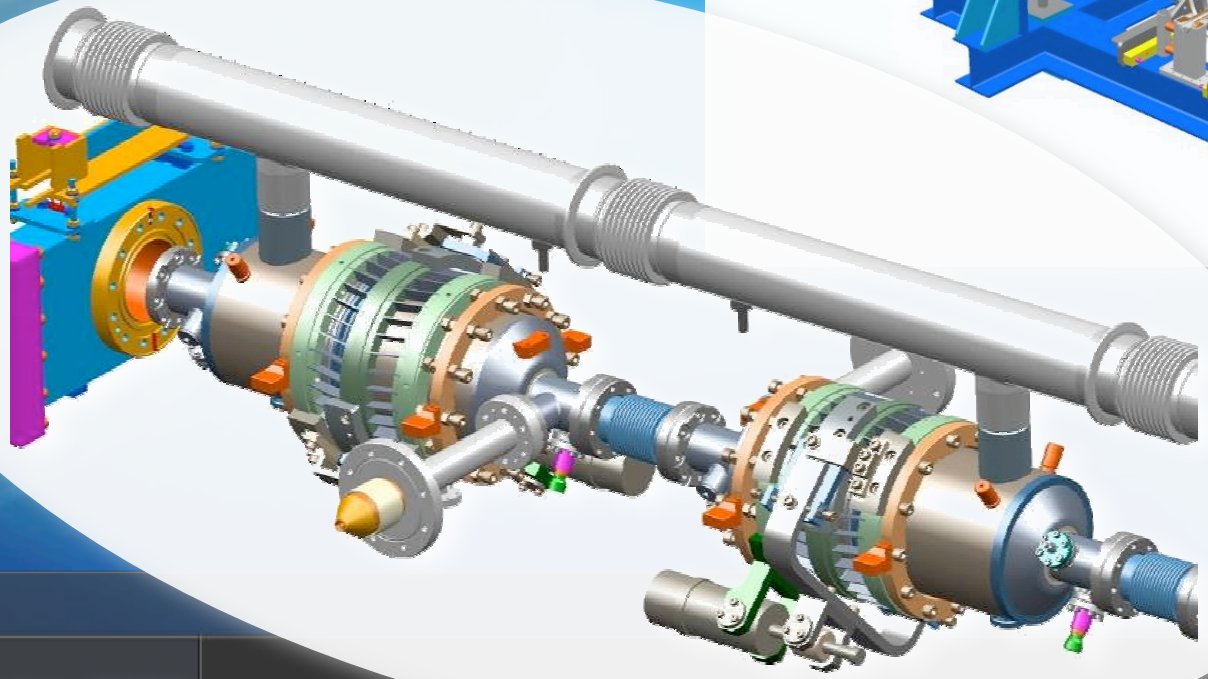


A baseline configuration document BCD has been created
R&D for the BCD has been identified
Alternative solution are investigated

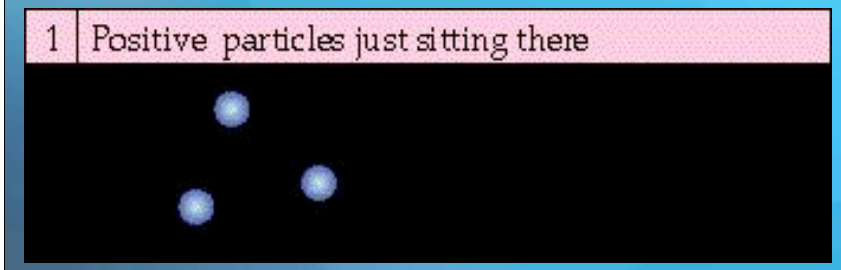
20 miles of SC cavities

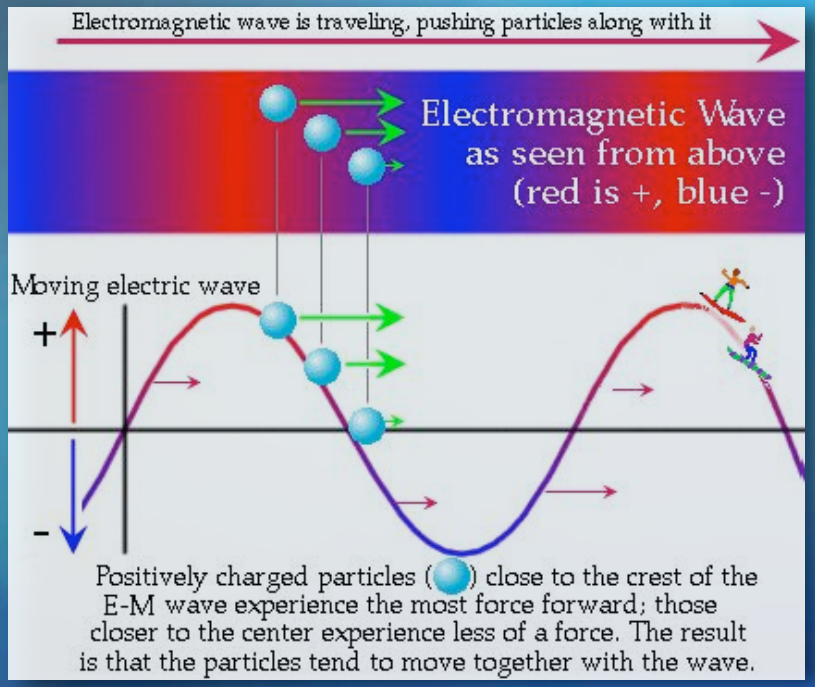




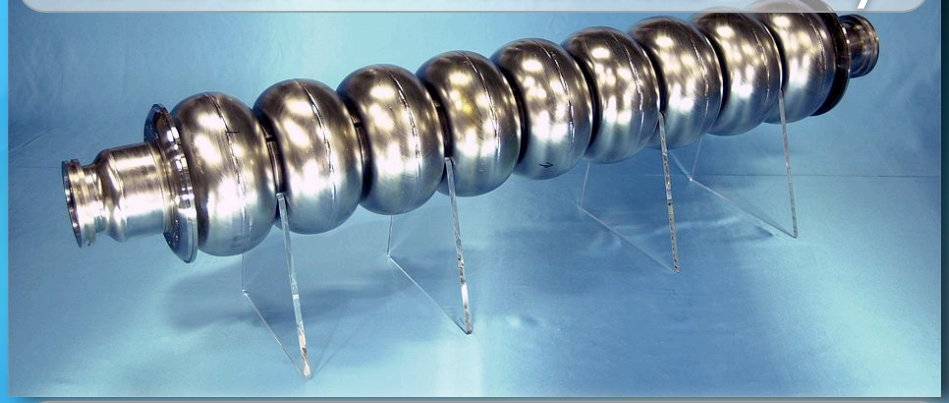


Superconducting RF Cavity





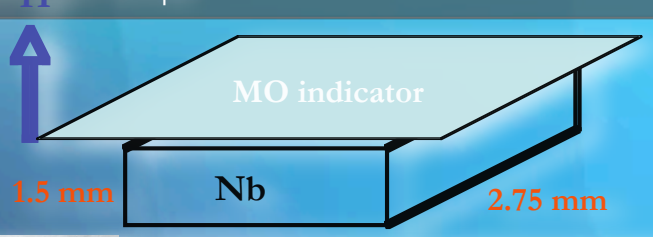
1.3 GHz 9-cell Niobium SRF Cavity

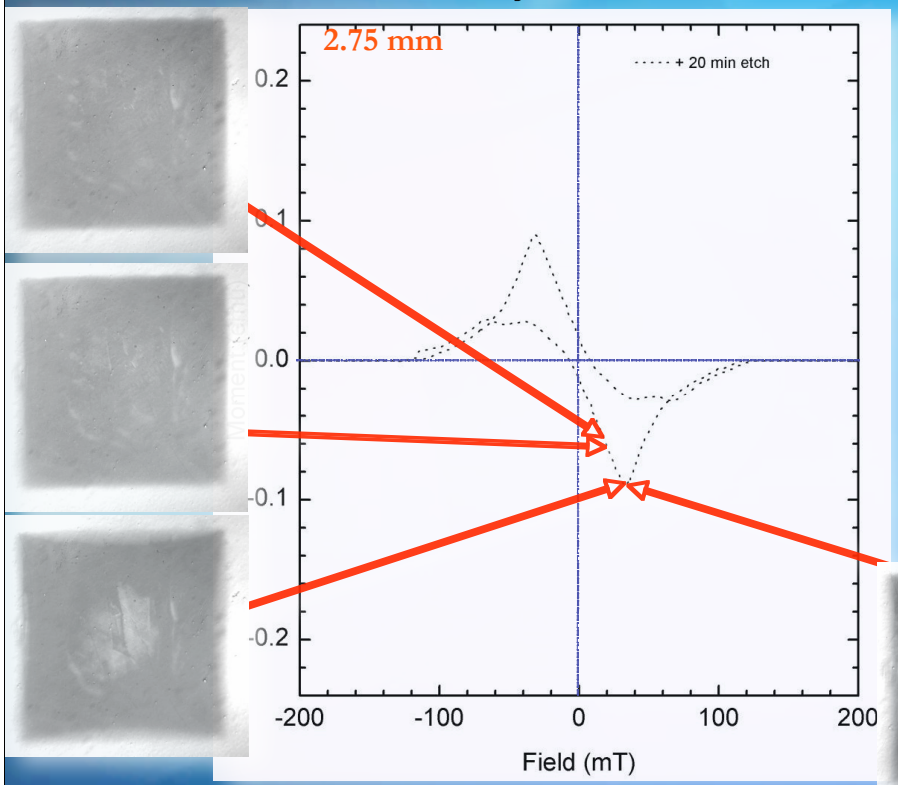


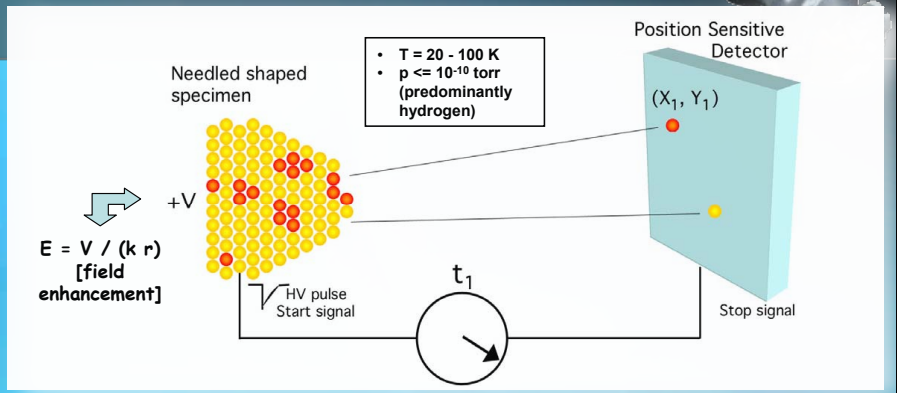
20,000 cavities are needed
Long fabrication and processing
Use very sophisticated techniques like:
electron beam welding
electropolishing
high pressure rinsing

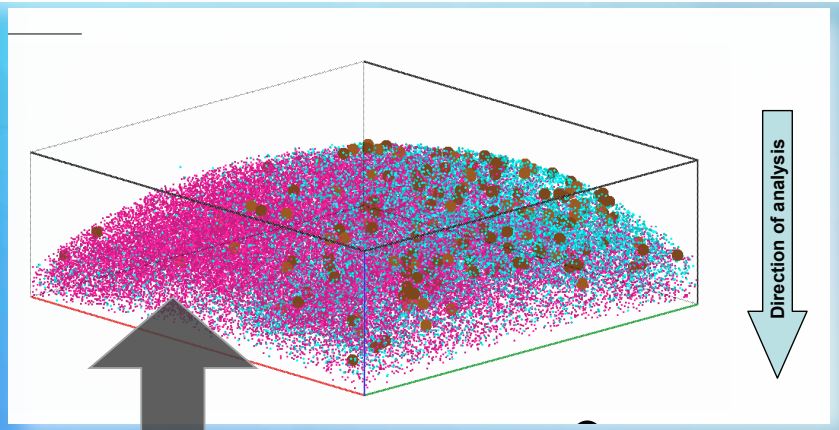
GOAL: SUPER CLEAN SURFACE

Nb Superconductivity









Northwestern Univ.

Univ. Wiaconsin

International Collaborative Effort

ASIA

Indian Linear Collider

KEK 高エネルギー加速器研究機構

Korean Linear Collider Studygroup

EUROPE

ECFA Study
Physics and Detectors for a Linear Collider

LAL LABORATOIRE DE L'ACCÉLÉRATEUR LINÉAIRE

DESY

INFN

TESLA Warszawa

CERN

CCLRC

AMERICA

American Linear Collider Physics Group

ARGONNE NATIONAL LABORATORY

BROOKHAVEN NATIONAL LABORATORY

Fermilab

Jefferson Lab
Exploring the Nature of Matter

CORNELL UNIVERSITY LEPP
LABORATORY FOR ELEMENTARY-PARTICLE PHYSICS

Los Alamos NATIONAL LABORATORY EST.1943

International Linear Collider at Stanford Linear Accelerator Center

75 Years of World-Class Science 1931-2006 Berkeley Lab